

Abstracts

Minisymposium 2

Maritime epidemiology

M2.1 SELF-REPORTED HEALTH AMONG FORMER NORTH SEA DIVERS

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Introduction: Complaints about deteriorated health have for several years been raised among former North Sea divers, initiating in 2000 a study at request of the Norwegian Health authorities.

Methods: Ninety six out of the 375 former Norwegian North Sea divers were through their medical doctor referred to Haukeland University Hospital (HUS) where a thorough examination was performed. A case control design was used with two control groups. One was a random sample of the male general population (151) matched by age and the other comprised the former North Sea divers not referred to HUS. The three groups filled in a questionnaire that gave personal background data, data on diving education, diving activity, and social and economic status. Former and present disease as well as actual health status was recorded using a modified SF36 and Fatigue Severity Scales.

Results: Cerebral/spinal decompression sickness (DCS) (OR 6.84 (CI 2.37 to 20.1)) and other types of DCS were more frequent (OR 5.99 (CI 2.69 to 14.28)) among referred divers compared to non-referred. Referred divers reported more years of diving exposure, more air dives and days in saturation, and a higher maximal depth than non-referred divers. They also reported more symptoms from the nervous system and the musculoskeletal systems and had more psychological complaints, forgetfulness, attention deficiency, joint pain, and tiredness were the most prevalent symptoms. The prevalence of complaints was significantly higher than in the general population. The non-referred divers also reported a higher occurrence of such complaints than the general population, but the frequencies were lower. The divers experienced reduced quality of life, constraining their life at work and spare time.

Conclusion: Both groups of divers had more complaints and illness than the general population with impact on quality of life. The differences between the groups suggest a dose-response association.

M2.2 NON-FATAL OCCUPATIONAL INJURIES RELATED TO SLIPS, TRIPS, AND FALLS IN SEAFARING

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Background: Merchant seafaring often involves hazardous occupational operations and several studies have shown increased overall injury mortality. Reporting, analysis, and prevention of slip, trip, and fall (STF) injuries on ships have previously been of little interest. This study was carried out in order to describe the risks for STF injuries in the merchant fleet, as part of a large international study. The aim of this study was to describe the risks involved in STF injuries in merchant seafaring, in order to point out areas for prevention.

Methods: A questionnaire study was carried out in 11 countries with 6461 participants in one or more medical clinics (31 clinics in all) in connection with the seafarers' attending their mandatory health examination. The seafarers gave information on whether they were injured during their latest tour of duty. The proportion of STF was identified by a separate question: "Did you fall, slip or trip in connection with the injury?" (Yes or No). Adjusted odds ratios and 95% confidence intervals by use of multiple logistic regression analysis were used to

control for confounding from other independent variables (for example, age, nationality, area on ship, etc).

Results: 43% of the total reported injuries (n=467) were STF related. Fractures and sprains accounted for 42% of the STF injuries compared with 17% for non-STF injuries. The proportions of STF injuries for different types of ships and areas of the ships varied from <30 to >60%, particularly work on passenger ship decks, where STF injuries were >60%. The proportions of STF injuries increased by higher age by increasing number of days unfit for duty from work. Complaints from prolonged discomfort and the average number of days unfit for work were highest for STF injuries.

Conclusions: Injuries related to STF on merchant ships were more frequent than previous estimates. There is a need for improvements in defining, reporting, and preventing STF injuries in merchant seafaring.

M2.3 OBTAINING INSIGHT IN HEALTH, SAFETY, AND ENVIRONMENT CULTURE IN A PETROLEUM COMPANY IN NORWAY

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Introduction: The Norwegian Petroleum Directorate specifies in its regulations that enterprises must have a sound health, environment, and safety (HSE) culture. HSE culture is about human behaviour and attitude, competence, organisation, and collaboration and about procedures and physical conditions. It is necessary to use different methods, both quantitative and qualitative, and to see the different measurement instruments in connection, to obtain an insight in the HSE culture.

Methods: Data from the existing measurement and registration instruments in the company, concerning HSE, were analysed to reveal connections and disconnections. This gives opportunity to see the connections between what employees and managers say about HSE, through questionnaires, and what the company measures in objective incidents data. An analysis of the results from the annual corporate working environment and organisation survey in the company, and from annual statistics on accident/incident data, sick leave data, emission data, and waste sorting was performed. The data were collected from four different data sources. The analyses are done in three different levels in the organisations, from the business units (17 different units) to the plant (factory) and the department level (100 units). The incident and environment data were from 2000–04 and the annual corporate working environment and organisation survey and sick leave data were from 2003 and 2004. It included about 5000 employees.

Results and Conclusions: The material, methods, and results from an example of analysis will be presented for discussion. The study may give answer to the hypothesis that comparing and analysing the results from different HSE measurement instruments in the company might give a better understanding of the strengths and weaknesses in the HSE culture. Such insight in the HSE culture is a prerequisite to point out the right measures regarding how to improve and strengthen the HSE culture and thus the HSE results in an enduring manner.

M2.4 THE ESTABLISHING OF THE NORWEGIAN OFFSHORE OIL WORKER COHORT: A COHORT FOR PROSPECTIVE CANCER INCIDENCE AND MORTALITY STUDIES

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Introduction: The Norwegian offshore oil industry has been employing several tens of thousands workers since it started in the late 1960s. Factors known to cause disease in other industries are also present in the offshore work environment. Among harmful agents that are more or less specific to the work on the platforms are crude oil, gas, and drilling mud. Intensive work periods and long leave periods, a diet rich in fat and calories, cheap tobacco, a ban on alcohol consumption on the platform, and worry about helicopter flights and platform safety are also factors that may influence on the workers' health. The study is a cooperation with the Norwegian Oil Industry Association, and the aim is to establish a cohort of Norwegian offshore oil workers for future cancer incidence and mortality studies.

Methods: The project started in 1996 by identifying present and former workers on the platforms on the Norwegian continental shelf. The main contributors to the crew lists were oil companies, contracting companies, trade unions, safety training schools, and the National archives of Norway. A possible source of error was the inclusion of other than platform workers. In 1998 a self-administered questionnaire was distributed by mail to the 57 000 workers alive in Norway. The questionnaire included questions on offshore job history, other occupation, leisure time activities, smoking, alcohol consumption, and diet.

Results: The survey gathered 35 200 answers (a response rate of 62%), whereof 7200 from respondents who had not worked on the platforms. The remaining 28 000 respondents constitute the cohort to be followed up and is the world's largest of its kind. Start of follow up was 01.01.1999. The median year of birth is 1955, and 9% are women.

Future Research: The cohort will be the source of numerous publications in the years to come. Because of the the young cohort, 10 years of follow up is needed. The cohort will be linked to the cancer database in the Cancer Registry of Norway and the Cause of Death Registry in Statistics Norway. Standardised incidence rates for cancer (SIR) and mortality rates (SMR) will be calculated. Job exposure matrixes (JEMs) are prepared by the Section for Occupational Medicine, University of Bergen.

M2.5 EXPOSURE TO OIL VAPOUR AND OIL MIST DURING OFFSHORE DRILLING

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Introduction: Drilling mud consists of a mixture of water or oil based fluids and a number of additives. The objectives of this study were to quantify personal exposure and to identify important determinants of exposure to oil mist and oil vapour originating from oil based drilling mud. The present exposure assessment will be used in an epidemiological study of cancer among offshore oil workers.

Methods: Monitoring reports dealing with personal exposure to oil based mud were gathered. These reports were from the years 1979–2004 and included 37 drilling facilities on the Norwegian continental shelf. Analysis of time trends and determinants of exposure was done with mixed effects models for samples of oil mist ($n = 318$) and oil vapour ($n = 327$), with drilling rig entered as a random effect. These models included the samples from 1989–2004 taken with the presently used sampling method of filter/charcoal tube in series.

Results: Samples had been taken during use of three generations of drilling mud, as classified by the main type of base fluid present; diesel (1979–84), low aromatic mineral oils (1985–97), and non-aromatic mineral oils (1998–2004). The samples taken before 1984 showed high exposure to diesel vapour ($AM = 1217 \text{ mg/m}^3$). When low aromatic base oils were used exposures to oil mist and oil vapour were 4.30 mg/m^3 and 36.3 mg/m^3 , whereas the overall AM for oil mist and oil vapour was significantly reduced to 0.538 mg/m^3 and 16.1 mg/m^3

for non-aromatic base oils. Downward time trends were indicated for both oil mist (6% per year) and oil vapour (8% per year) when introducing the year of monitoring as a fixed effect in a mixed model analysis. Rig type, mud temperature, and purpose of sampling were significant determinants of exposure to oil mist. For oil vapour exposure the rig type, base oil type, viscosity of base oil, work area, season, and mud temperature were significant determinants. When introducing the determinants as fixed effects in the mixed models, the major decreases in variability were found for the between rig components.

Conclusion: Downward time trends in exposure levels for oil mist and oil vapour were found in the mud handling areas of offshore drilling facilities. Exposure levels were associated with rig type, technical control measures, mud temperature, viscosity of base oil, work area, and season.

M2.6 MORBIDITY AMONG SEAMEN: THE DANISH SEAFARER, FISHERMEN, AND LONG DISTANCE DRIVERS' HEALTH AND EARLY RETIREMENT STUDY

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Introduction: Seafarers and fishermen have a high morbidity. This study aimed to investigate the occurrence of diseases of the heart (stress, noise), lung (diesel exhaust, tobacco, infections), ear (noise induced hearing loss), gastrointestinal canal and diabetes (dietary and lifestyle factors), skin (reactions to oil or water), loco-motor system and veins (vibrations, physical demanding work, accidents), and mental (loneliness, stress) and infectious diseases, as well as notified occupational diseases among Danish seafarers and fishermen.

Methods: A cohort of all Danish seafarers with active employment in 1999–2002 registered by the Danish Maritime Authority and fishermen registered by pension and tax registries were linked with the nationwide hospitalisation registry, and with a registry from the Danish National board of industrial injuries where all occupational diseases and injuries causing compensation are legally treated. Data for all gainfully employed were extracted from employment registries from Statistics Denmark.

Results: A total of 178 and 125 approved occupational diseases were identified among seafarers and fishermen, respectively, yielding incidence rates of 3.8 and 5.0 per 1000 employed per year. In all 143/100 of these resulted in permanent disability on 5% or more. The overall estimated incidence of occupational diseases was three and four times higher than among the total Danish working force. Age and job type were risk factors for notified occupational diseases causing permanent disability.

Conclusions: This study report a high occurrence of notified occupational diseases among Danish seafarers and fishermen, and specific risk factors were identified.